Spring 2015

Examples of EnGaugements

Judith Longfield
Georgia Southern University, jlongfield@georgiasouthern.edu

Examples of EnGaugements

Brainstorming Answer the following question in large group. One person records answers. Optional: Arrange the list into two or more categories (e.g., abiotic vs. biotic factors) *Question*: What does a plant need to survive?	Brainstorming elicits responses from large audiences and aggregates them into a single list. It provides the instructor and students with an overview of the groups' collective knowledge. By separating the brainstorm list into tow or more categories, students evaluate how well they understood the role of ach response in a specific context.
Case study and decision making Reading the following case. Write a paragraph to explain what the patient should do next. Justify your recommendation with biological reasons. *Case*: A patient expressed eye irritation, which the doctor diagnosed as conjunctivitis. Antibiotics treatment alleviated the symptoms within a few days, but the symptoms returned two weeks later. The doctor recommended taking antibiotics again.	Cases engage student in solving a problem in a real-life context. To solve them, student need to evaluate what they know about infectious disease, causal agents, and antibiotic resistance; apply that knowledge to the case;; and determine what additional information is needed to make a recommendation.
"Clicker" questions Answer the following question on your electronic response keypads. *Question*: Which organisms are most distantly related? (a) bacteria and archaea; (b) plants and animals; (c) plants and fungi; (d) humans and fungi.	Clicker questions require students to gauge whether they understand a concept or topic, thereby engaging students in the ensuing activities (e.g., lecture) about that topic.
Group quiz/exam Work with a group to discuss the following statement. Write your answer individually. *Statement*: Explain the role of aflatoxin in liver cancer.	Group exams engage student in working collaboratively to identify creative solutions to a problem. Writing individual answers requires students to evaluate how well they understand the topic and its underlying concepts.
Concept or mini-map Arrange the following terms in logical order. Explain (using arrows or words) how the terms relate to each other. *Terms*: tRNA, DNA, protein, mRNA, amino acid, translation, transcription, replication, promoter.	Mini-maps engage student in developing a non-verbal representation of a concept. The process of developing a visual arrangement requires students to evaluate different ways that terms can be related to each other and to appreciate that a biological process may not be unidirectional or linear.
One-minute paper Write for one minute to answer the following question. *Statement*: What about the structure of DNA suggests a mechanism for replication.	One-minute papers engage student in articulation their knowledge to another situation. By writing their answer in one minute, students need to evaluate the most important and relevant components of their arguments.
Pre/post questions Write for one minute at the beginning and end of class in response to the following statement. Explain any differences between your responses. *Statement*: Describe two mechanisms that a bacterium can use to harm a plant.	Pre/post questions can take many forms, including one-minute papers or clicker questions. They engage students in thinking critically about a specific question or problem. By comparing pre-post responses, students evaluate whether and why their answers changed during the class period.
Strip sequence Use your textbook as a guide and work with a partner. You write the important steps in meiosis; your partner writes the important steps in mitosis. Cut the steps apart and scramble the order. Each of you should try to put the other person's steps into the correct order. Discuss.	Strip sequences engage student in recognizing cause and effect and in determining the logical sequence of events. When students derive their own strip sequences, they need to evaluate the critical steps in the process.
Statement correction Discuss with a partner what is wrong with the following statement. Propose an alternate statement that is correct. *Statement*: "I don't want to eat any viruses or bacteria, so I refuse to buy foods that have been genetically modified."	Statement corrections engage student in evaluating what concepts are misrepresented and in determining that information they need to correct it.
Jigsaw In assigned groups, compare solutions to today's homework problems. Group T compare answers to problems 1 & 5, Group E to 2 & 4, Group A to 3 & 8, Group M to 6 & 7. Develop a group consensus. In 10 minutes you will return to your home TEAM and review the solutions to the problems. Be prepared to help TEAMmates who did not understand the problem come up with a correct solution AND to work similar problems.	Jigsaw groups require students to become experts on a problem solution and to teach it to their home TEAMs. Even if some students don't understand the problem, they learn how to solve it from classmates who have solved the problem. Their learning is reinforced when they teach it to TEAMmates.

Source: Handelsman, J; Miller, S.; & Pfund, C. (2007). *Scientific Teaching*. New York, NY: W.H. Freeman & Company. pp. 54-55. (Except *Jigsaw*.)